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Afshar et al.

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(54) **DATA MANAGEMENT SYSTEMS FOR COLLISION REPAIR COACHING**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 460 days.

(21) Appl. No.: **12/363,116**

(22) Filed: **Jan. 30, 2009**

(65) **Prior Publication Data**

US 2009/0197228 A1 Aug. 6, 2009

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/196,374, filed on Aug. 2, 2005, now Pat. No. 7,487, 018.

(60) Provisional application No. 60/598,942, filed on Aug. 4, 2004.

(51) **Int. Cl.**
G06F 17/30 (2006.01)

(52) **U.S. Cl.**
USPC **701/29.6; 701/31.6; 701/31.7; 701/32.3; 701/32.9; 701/33.2; 701/33.4; 701/33.7**

(58) **Field of Classification Search** 701/29, 701/33, 29.6, 31.6, 31.7, 32.2, 32.9, 33.2, 701/33.4, 33.7; 705/4, 7.27
See application file for complete search history.

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Primary Examiner — Darnell Jayne

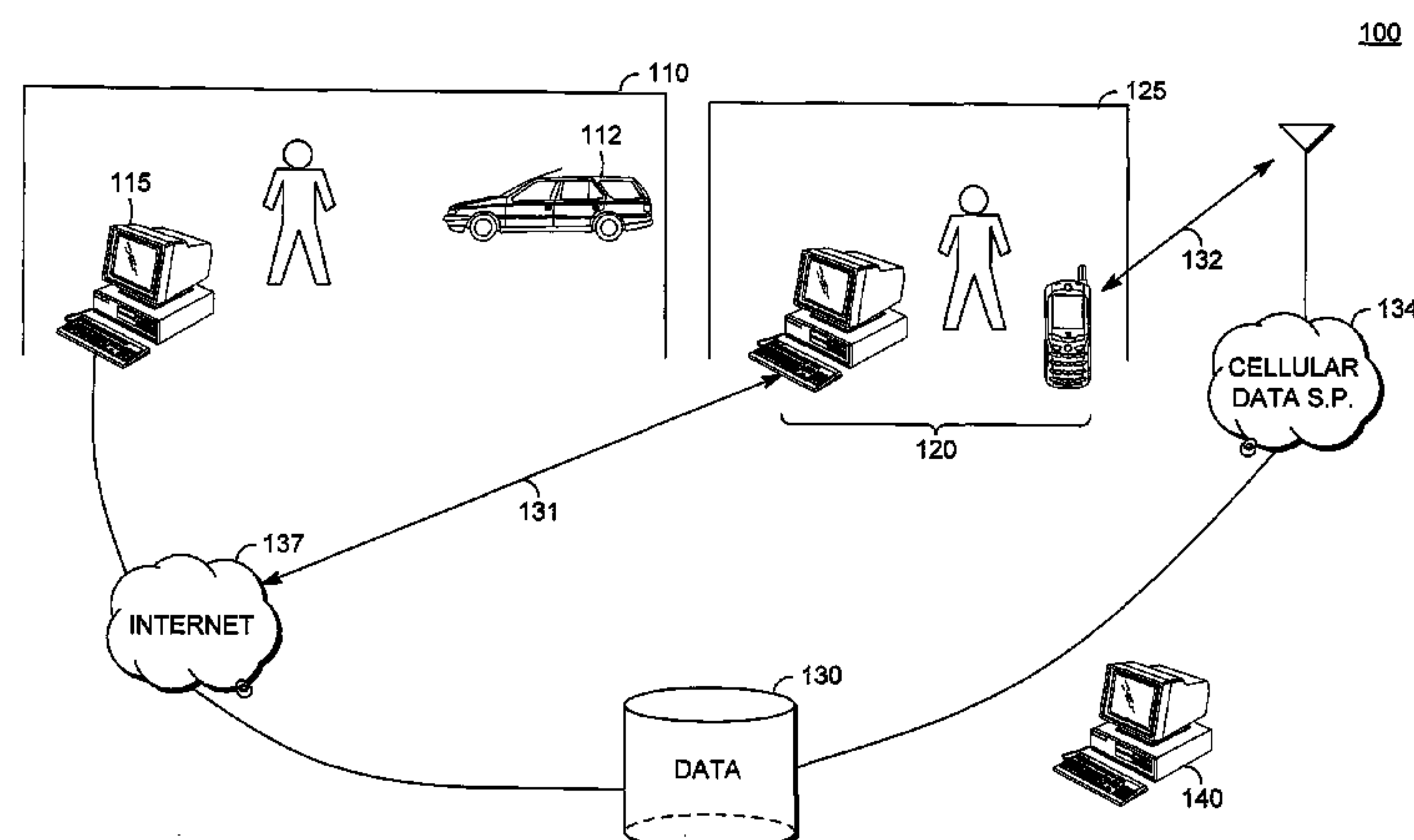
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(57) **ABSTRACT**

A system for on-site collection of evaluation data at a vehicle repair installation site is disclosed. Generally the system includes a computing tool connected to a database, a workflow operations guiding module that runs on the computing tool, an evaluation module, a comparison module, a data-mining module, a certification module, a legal compliance module, and a repair procedure compliance module. As a vehicle is repaired, the workflow operations guiding module prompts a coach with questions. The evaluation module performs a quantitative analysis of the answers provided by the coach and the comparison module compares the result of the quantitative analysis against aggregated or averaged information. The certification module compares information from the comparison module against predetermined certification criteria and the data mining module identifies correlations, trends or patterns in collected data by the system.

21 Claims, 9 Drawing Sheets



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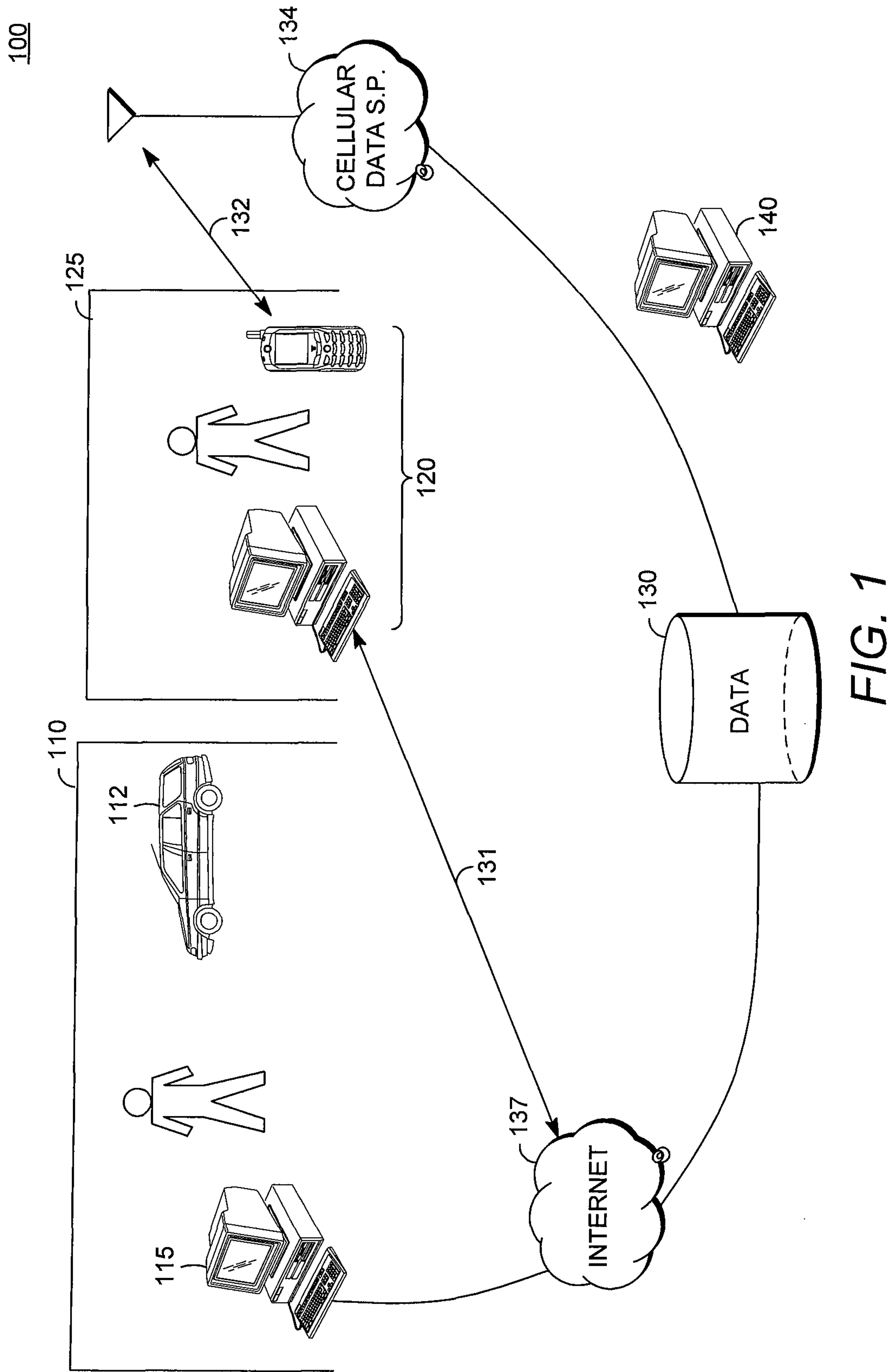
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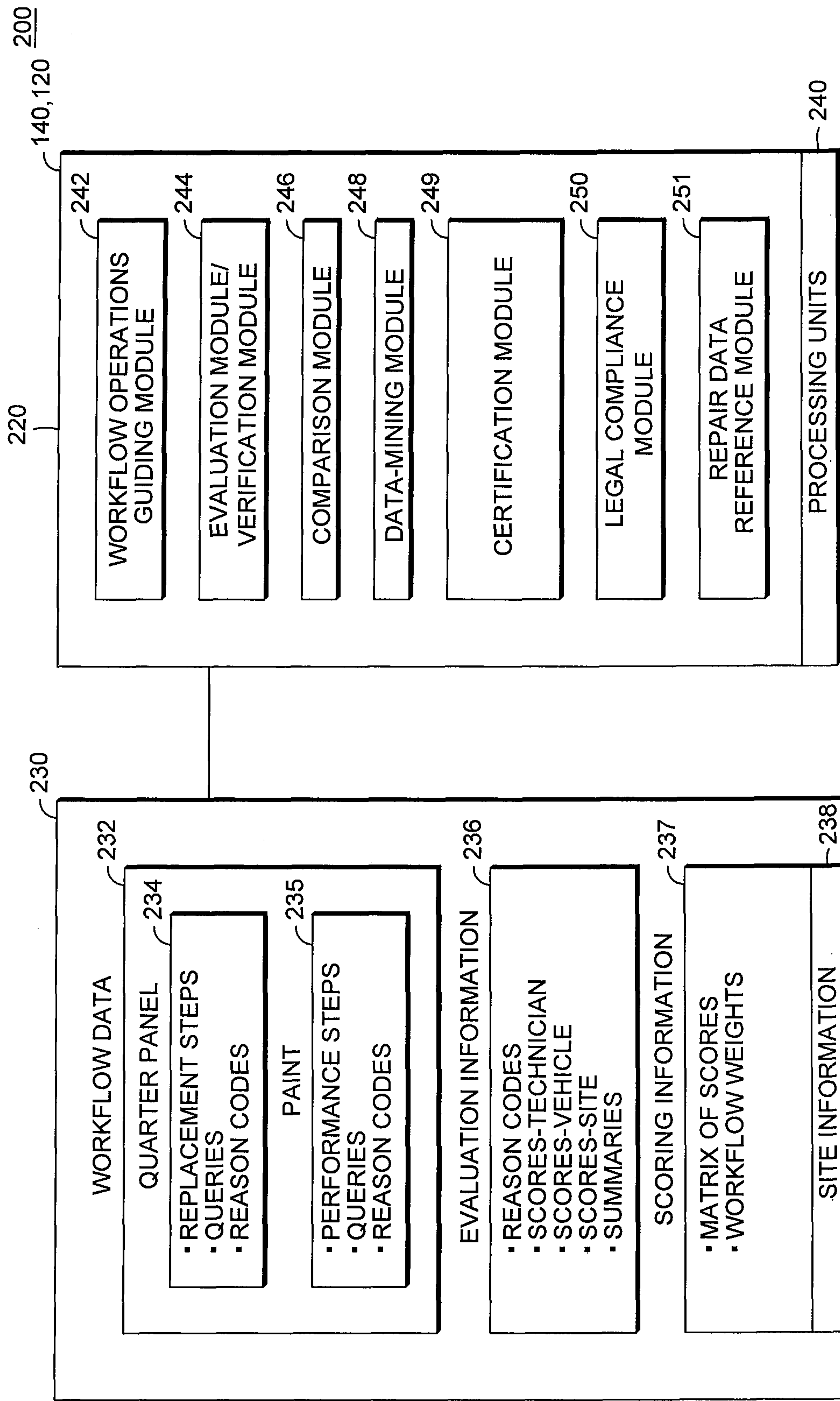


FIG. 2

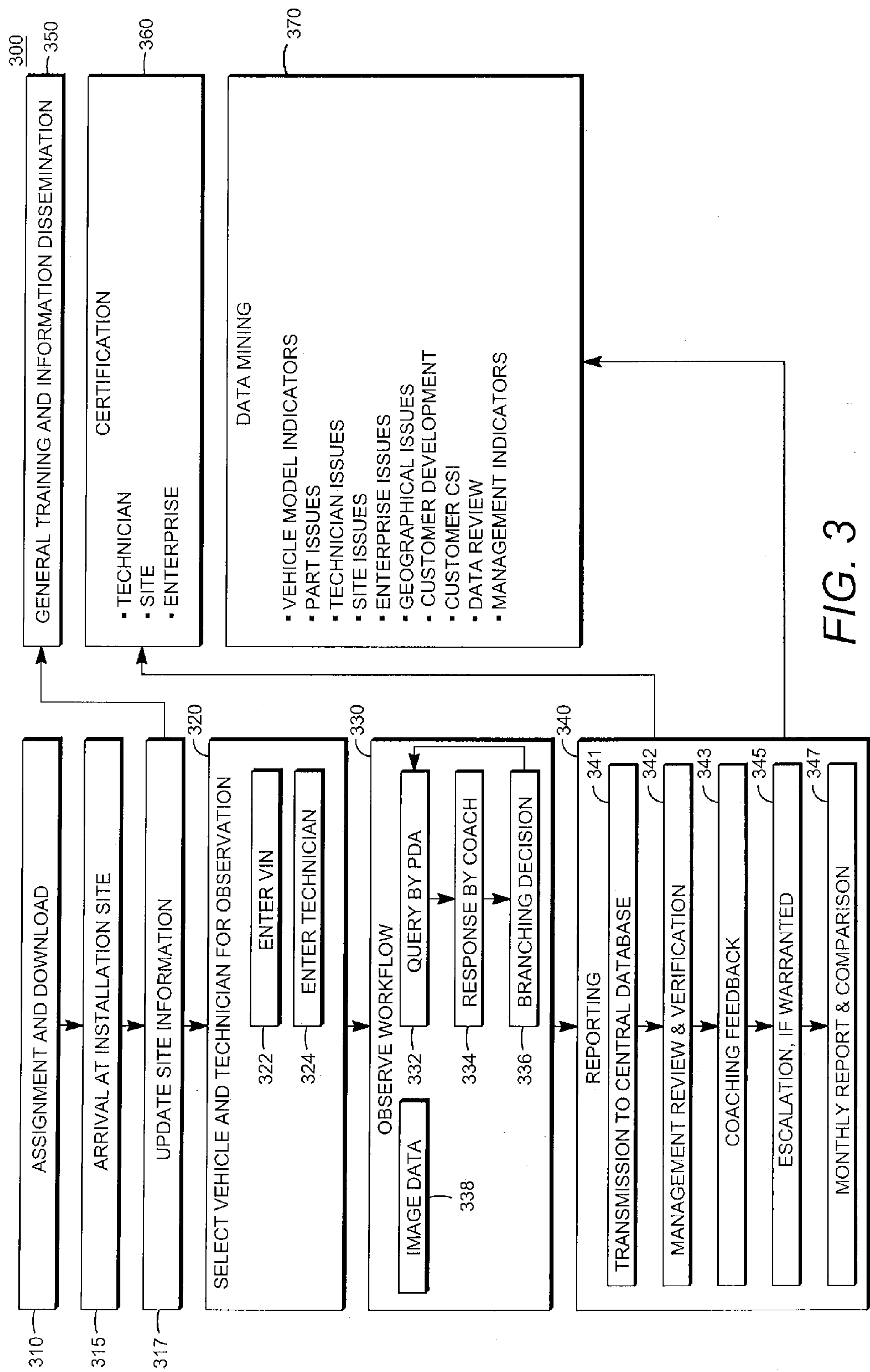


FIG. 3

400

ASSIGNMENT DETAILS

ACME AUTO BODY
123 MAIN STREET. SUITE 270
PASADENA. CA 91106
(213) 215-5528 — 410

SCHEDULED DAY TO VISIT

MAY ▼ 18 ▼ 420

UPDATE SCHEDULE 430

DECLINE ASSIGNMENT 440

VIEW TECHNICIAN LIST AND CERTIFICATIONS 450

VIEW NOTES 460

PREPARE FOR INSPECTION 470

FIG. 4

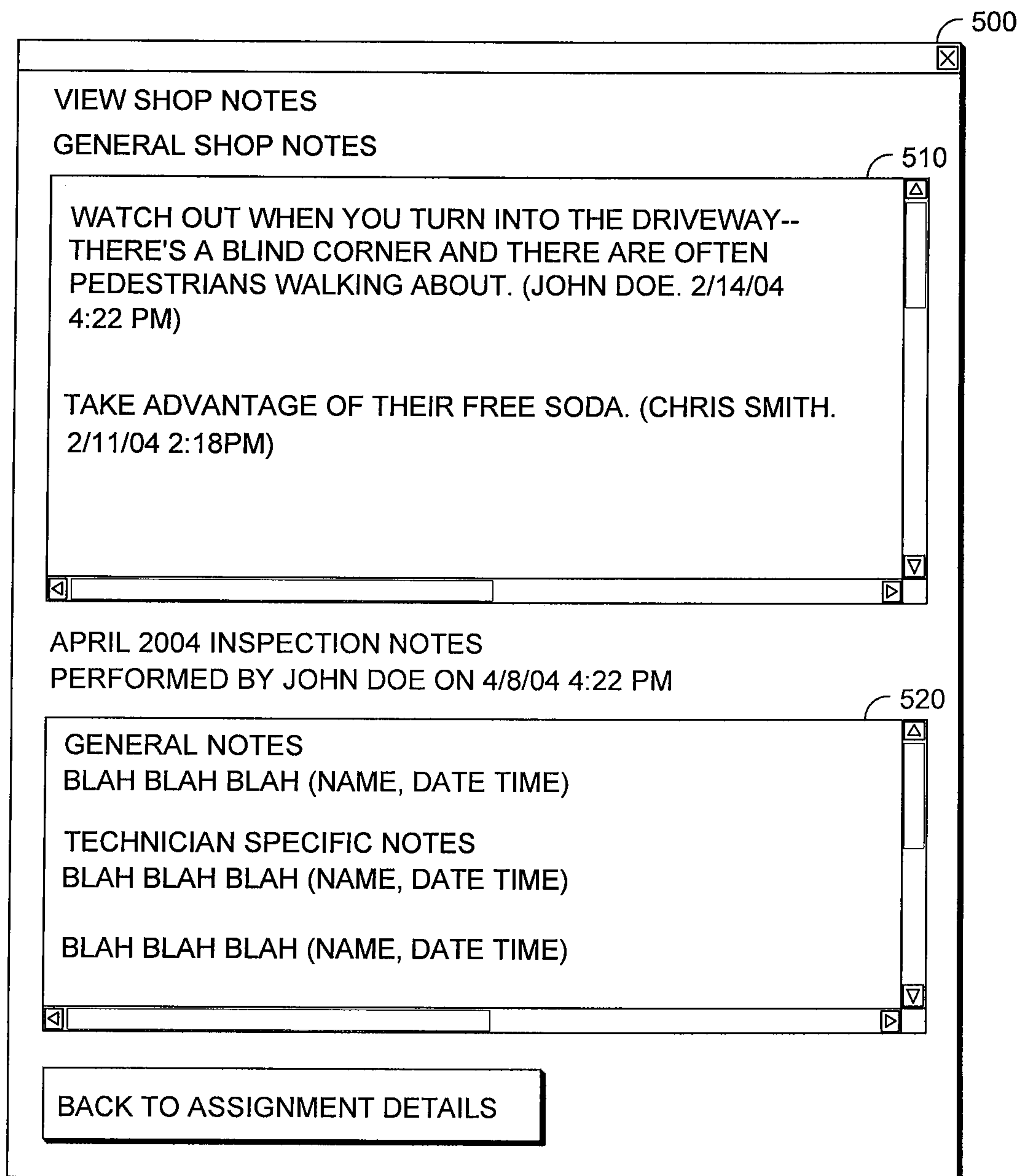



FIG. 5

600

☐ POCKET_PC

FILE ZOOM TOOLS HELP

 ADD NEW TECHNICIAN

FIRST NAME

610

BUD

LAST NAME

610

SSN

610

DEPARTMENTS
(CHECK ALL
THAT APPLY)

☐ BODY

☐ DETAIL

☐ PAINT

620

630

BACK

SAVE & ADD ANOTHER

SAVE & DONE ADDING

FIG. 6

700

3D MEASURING
ACME AUTO BODY
VEHICLE# 4, RO# 128409. JACK YOUNG

PLEASE ENTER FIELDS BELOW (**BOLD ARE REQUIRED**)

STEP #2 OF 8 IN "3D MEASURING" — 720

WERE THE CLAMPS APPLIED PROPERLY? — 725

DEPARTMENT(S): BODY

☐ YES ☒ NO — 730

TECH JACK YOUNG ▾ — 740

ADD TECH

THIS TECH HAS COMMITTED THIS OFFENSE 1 TIME(S) BEFORE — 750

NOTE 760 — PLEASE SELECT ONE ▾ — 770

ESCALATE WILL COACH PERSONALLY ▾ — 780

790 {

NEXT SKIP BACK TO WORKFLOWS

FIG. 7

ACME BODY SHOP
123 MAIN STREET
SUITE #200
PASADENA, CA 94404
MAIN: (626) 555-1212/ FAX: (626) 555-2882

CHARLES GREEN, PRIMARY VERIFACTS COACH
JOHN DOE, OWNER
SUSAN DOE, OWNER

CHRIS SMITH, PRIMARY MANAGER (SHOP MANAGER)
ALVIN JOHNSON, MANAGER (FLOOR MANAGER)

(800) 381-3447
HELP_SUPPORT@VERIFACTSAUTOMOTIVE.COM

ENTER TECHNICIAN INFO
PLEASE ENTER THE INFO FOR THE NEWLY ENTERED TECHNICIAN BELOW
FIELDS IN BOLD ARE REQUIRED

THIS TECHNICIAN WAS ENTERED INTO THE SYSTEM DURING THE INSPECTION ON APRIL 11, 2004. THIS TECHNICIAN HAD THE FOLLOWING RATING(S) AND NOTE(S):

- RATING: 0 FOR "DRILL/GRIND SPOT WELDS" IN BODY
- RATING: 10 FOR "PROPER AND COMPLETE WELDS" IN DETAIL
- NOTE: PHIL WAS UNCOOPERATIVE WHEN TRYING TO COACH HIM ON PROPER WELDING TECHNIQUES

FIRST NAME: PHIL

LAST NAME: ATKINSON

NAME ON CERTIFICATE: PHILLIP J. ATKINSON

SSN: 111-22-1234

DEPARTMENTS:
(CHECK ALL THAT APPLY)

☒ PAINT

☐ DETAIL

☐ BODY

EXPERIENCE LEVEL: JOURNEYMAN

HOME ADDRESS:

1500 MAPLE AVENUE

APT. 1221

SOUTH PASADENA

CALIFORNIA ZIP: 91606

805

PRIMARY PHONE: (626) 555-1212

SHOP PHONE: (626) 555-1212

CELL PHONE: (626) 458-1234

SSN: 111-22-1234

SPECIALTIES:

PAINT

DETAIL

BODY

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SPECIALTIES:

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ALVIN JOHNSON, MANAGER (FLOOR MANAGER)

(800) 381-3

FIG. 8

900

SUPPORT@VERIFACTSAUTOMOTIVE.COM

(800) VERIFACTS

ACME BODY SHOP

123 MAIN STREET

SUITE #200

PASADENA, CA 94404

MAIN: (626) 555-1212/ FAX: (626) 555-2882

CHARLES GREEN, PRIMARY VERIFACTS COACH

JOHN DOE, OWNER

SUSAN DOE, OWNER

CHRIS SMITH, PRIMARY MANAGER (SHOP MANAGER)

ALVIN JOHNSON, MANAGER (FLOOR MANAGER)

TECHNICIAN INFO CONFIRMATION

THANK YOU FOR UPDATING YOUR RECORDS IF THERE ARE ANY MISTAKES. PLEASE PUSH THE "EDIT AGAIN" BUTTON BELOW

FIRST NAME:

PHIL

LAST NAME:

ATKINSON

NAME ON CERTIFICATE:

PHILLIP J. ATKINSON

SSN:

XXX-XX-1234

DEPARTMENTS:

☒ PAINT

☐ DETAIL

☐ BODY

EXPERIENCE LEVEL:

JOURNEYMAN

YEARS OF EXPERIENCE:

12

SPECIALTIES:

HOME ADDRESS:

1500 MAPLE AVENUE

APT. 1221

SOUTH PASADENA, CA 91606

EDIT AGAIN

CLOSE WINDOW

PRIMARY PHONE:

CELL

SHOP PHONE:

(626) 555-1212

CELL PHONE:

(626) 458-1234

PRIOR CERTIFICATIONS:

☒ I-CAR

☐ ASE

☐ VERIFACTS

☐ OTHER:

FIG. 9

1

DATA MANAGEMENT SYSTEMS FOR
COLLISION REPAIR COACHING

RELATED APPLICATIONS

The present patent document is a continuation-in-part of U.S. patent application Ser. No. 11/196,374 (now U.S. Pat. No. 7,487,018), filed Aug. 2, 2005, which claims the benefit of the filing date under 35 U.S.C. §119(e) of Provisional U.S. Patent Application Ser. No. 60/598,942, filed Aug. 4, 2004, the entirety of each of which are hereby incorporated by reference.

FIELD OF THE INVENTION

The invention relates generally to tools for monitoring and coaching automotive repair procedures, and more specifically to systems and methods for coaching, verifying, and certifying automotive collision repair.

BACKGROUND

Modern automotive maintenance and repair processes require the intensive use of information. As automobile models and the technology they use change from year to year, repair facilities need to constantly acquire and manage new data and knowledge on the appropriate technologies, procedures, and equipment used in repair and maintenance processes. This challenge is compounded by parallel changes in the tools and techniques used for the automobile industry. Many components of the automotive repair industry face these challenges, from collision repair, to inspection procedures, to mechanical repair.

One category of challenges involves the coaching of technical personnel performing the maintenance, inspection, and repairs of automobiles. As procedures change and as new personnel enter the industry or expand the scope of the work they perform, managers need to reliably review and improve the skills of their technical personnel and ensure that a high level of competence is maintained among the technical professionals in the industry.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF
THE DRAWINGS

Embodiments of the invention described below can be better understood with reference to the following drawings and description. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of these embodiments. Moreover, in the figures, like referenced numerals designate corresponding parts throughout the different views.

FIG. 1 shows an example of an environment for coaching of automotive services.

FIG. 2 illustrates one implementation of data and software usable in a coaching system for collision repair services.

FIG. 3 illustrates acts used in one implementation of a procedure for coaching, review, and certification.

FIG. 4 is an example of a screenshot for a computing tool interface for a coach to review an assignment to visit an installation site.

FIG. 5 is an example of a screenshot for a computing tool interface for reviewing notes on an installation site.

FIG. 6 is an example of a screenshot for a computing tool interface for updating a database with information on a new technician at an installation site.

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FIG. 7 is an example of a screenshot for a computing tool interface for observing a repair procedure.

FIG. 8 is an example of a screenshot for an interface for interacting with a remote database from an installation site.

FIG. 9 is an example of a screenshot for an interface for retrieving information from a remote database at an installation site.

DETAILED DESCRIPTION

FIG. 1 shows an example of an environment 100 for coaching of automotive services. This depiction includes an installation site 110 at which a vehicle 112 is undergoing repair, and which uses a computer system 115. The depiction additionally includes a coaching facility 125, which in some implementations is distinct from the installation site 110. However, in other implementations the coaching facility 125 may be the same as the installation site 110. As described in more detail below, a computing tool 120 may be present in the coaching facility 125 that is used to assist in coaching of the activities at the installation site 110. Generally, the computing tool 120 may be a personal digital assistant ("PDA"), a laptop or tablet computer, a cellular phone, a desktop computer, a server workstation or any other data device known in the art. In some implementations, the computing tool may be connected through a wireless link 132 and a service provider 134 to a database 130 to update and exchange information. The database 130 may also be maintained through one or more server computers 140. The data may be shared with other computers, such as computer systems 115 at installation sites 110, through an information network 137, such as the internet. Any person that participates in the repair process, such as technicians and managers, may also update information in the database 130 through the computer system 115.

The installation site 110 may be a location where automotive services, such as collision repair, vehicle maintenance, vehicle inspection, or automotive mechanical repair are performed. At the installation site, a number of technicians may work on a vehicle 112 undergoing repair. Generally, a technician may be any person that participates in the repair process. The technicians may follow repair procedures for the type of repairs needed on the vehicle 112. The technicians may obtain the repair information from reference manuals, spoken instructions, shared knowledge, or computer systems 115 used for reference.

To maintain and improve their skills, technicians and their managers may rely on coaches who may review the performance of the technicians and managers, and who may review the operations of the installation site 110 as a unit. Coaches may assist technicians, such as the shop personnel in a collision repair facility or mechanics in a mechanical repair facility, to maintain and expand their technical competence in a field whose knowledge base undergoes continuous change and growth. Coaches may also assist managers with overall quality review of an installation site's work, and with making ongoing improvements throughout the installation site.

To help monitor and improve the level of technical competence in an installation site, coaches may perform periodic visits to the installation site, such as weekly, monthly, or annual visits to the installation site. In some implementations, rather than physical visits to the installation site, coaches may perform periodic virtual visits to the installation site, where the coaches interact with technicians and observe technicians performing vehicle repair procedures using devices such as webcams that provide real-time video conferencing, or other

communication mediums such as emails that may include digital images of technicians performing vehicle repair procedures.

During physical or virtual visits, coaches may provide real-time feedback for technicians as the technicians carry out repair steps on a vehicle being repaired, and may further provide review feedback at the conclusion of a repair procedure, at the conclusion of a workflow (a defined portion or series of steps in a repair), or at the conclusion of the repair process. Coaches may further provide on-the-job professional review and advice for groups of technicians and managers during visits, and may evaluate and monitor technical and procedural practices of the technicians, managers, and support staff. One form of value added by coaches may be an ongoing improvement in the quality and efficiency of technical and procedural operations of the installation site **110**. As an external observer, a coach may verify the quality, propriety, or completeness of procedures and workflows performed at an installation site. Such a verification by a neutral observer can be a valuable assessment of automotive repair procedures.

With appropriate coordination, coaches may also improve the overall quality and efficiency and consistency of an enterprise of related installation sites, such as a set of installation sites under common ownership, or common branding, or in a franchise relationship or other relationship. Additionally, coaches may guide technicians, installation sites, and enterprises towards the achievement of recognized or customized certification standards. Coaches may also perform a certification-reporting function, whereby the coaches identify technicians, installation sites, and enterprises that have qualified for various certifications.

A coach may use a computing tool **120** to organize and collect information during a physical or virtual site visit. The computing tool **120** may be a mobile device such as a personal digital assistant (PDA), a notebook or tablet computer, a data-enabled cellular telephone, or any other portable data device, or the computing tool **120** may be device such as a desktop computer or a server workstation. In some implementations, the computing tool **120** may include a digital camera, a digital video camera and/or an interface to a portable camera. The computing tool **120** shares information with the database **130** and the server computers **140** through a wired link **131** or a wireless link **132** and a service provider **134**. Implementations including wireless links **132** may include a cellular data link provided by a cellular service provider. Other wireless links may also be used, with or without a service provider. For example, the wireless link **132** and the service provider **134** may be augmented or replaced by a satellite link (not shown).

Further, the computing tool **120** may be equipped with a wired communications port or backup port (not shown) that allows the computing tool **120** to connect with the database **130** through non-wireless networks. The wired communications or backup port may be built into the computing tool **120** or may be disposed in an adapter that attaches to the computing tool **120**. A wired communication port may be particularly helpful to a coach working in a region where the wireless link **132** is unavailable or unreliable. The wired communication port may provide connections to the database **130** through links such as through a telephone line, or through links made via a local computer (such as the computer system **115** or server computers **140**) with a USB, Bluetooth™, infrared, serial, or parallel link, or with a wired or wireless Ethernet link, or other links.

The computing tools **120** may be distributed to a team of coaches who provide coaching services to a number of instal-

lation sites **110**, as further described below. Computing tools **120** may be shared among coaches, or may be assigned to each coach. Alternatively, computing tools **120** may be provided only to coaches with the best ability to efficiently use the features provided in the tool. Coaches without computing tools may continue to enter information and evaluation data into the database **130** through other networked systems **115**.

Software running in conjunction with a processor of the computing tool **120** and the server computers **140** may be written in a variety of languages, such as C, C++, Java, or others, using a variety of programming architectures, including interpreted, compiled, or JIT translations. The software may be configured to run on a variety of operating systems, such as PalmOS™, Windows CETM, Windows™, Linux™, MacOS™, Microsoft.net™, and others.

FIG. 2 illustrates one implementation of data and software **200** usable in a coaching system for collision repair services. This figure shows a data collection **230** and a collection of software tools **220** used in conjunction with one or more processing units **240**. In relation to the environment depicted in FIG. 1, the data collection **230** and the software tools **220** may be stored on a variety of media, such as magnetic media, semiconductor media, or optical media, made accessible through the database **130**, the server computers **140**, and the computing tool **120**. The software tools **220** are configured to run on the one or more processing units **240**, which may be deployed in the computing tool **120** or in the server computers **140**.

The data collection **230** includes workflow data **232**, evaluation information **236**, scoring information **237**, site information **238**, and a reference repository **239**. The workflow data **232** specifies procedures and steps that may be used in a variety of workflows for collision repair. For example, as illustrated the workflow data **232** includes data on repair procedures for the replacement of quarter panels for automobiles **234** and on a procedure for the painting of an automobile **235**. The repair procedures may be indexed or categorized according to the make, model, and year of the automobile under repair. The repair procedures may further be linked to combine larger procedures, such as, for example, in a case where a bumper repair procedure may be linked to a subsequently required paint procedure.

Each procedure in the workflow data **232** may include a description of the steps required in the procedure, in a form that would be useful for a coach reading the steps on a computing tool **120**. The workflow data **232** may also include queries associated with each step to prompt a coach for information on the manner in which a technician performs the step. The workflow data **232** may further include prompts for various reason codes to allow a coach to expound on the manner in which a technician performs the step.

For example, a coach may observe, either in person or virtually, a vehicle undergoing the procedure of three-dimensional (3D) measuring, as an initial diagnostic (or as a final check) in collision repair. The process of 3D measuring involves mounting a vehicle on a rack with clamps connected to the vehicle at appropriate points. The positions of the clamps are then measured in order to detect any deformations in the frame or unibody structure of the automobile. To start, the coach may use a computing tool to record identifying information on the vehicle undergoing the repair, the technician performing the procedure, and the installation site at which the repair is being performed. The coach may then proceed to observe the technician performing the 3D measuring, and record observations on the computing tool in response to prompts generated by the computing tool.

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One of the steps in 3D measuring may involve a correct application of clamps to the vehicle during the initial phases of the 3D measuring procedure. Accordingly, the procedure data **232** may include appropriate reference information so that the computing tool **120** prompts the coach to check “Were the clamps applied properly?”

In response, the coach may enter a “Yes” or a “No” response. This response may be entered, for convenience, through a selection interface, such as a checkbox or radio button interface on the computing tool. The coach may additionally supplement this response with the selection of a reason code in the workflow data **232**. A reason code is a discrete identifier of a reason for a coach’s response to an automatically prompted query. For example, a specific reason code may signify “Clamps placed in incorrect location for this model of vehicle” in the context of a query regarding proper application of clamps during a 3D measurement procedure.

In addition to selecting a reason code, the coach may further enter additional textual notes. If the step was not properly completed by the technician, the coach may select a corrective action. For example, the coach may record a decision to escalate the issue to require a discussion with the technician’s manager. Alternatively, the coach may record a decision to follow up with personal instruction to the technician, or record a note to receive a prompt for follow-up discussion or checking in a subsequent site visit.

All the prompting information to the coach may be pre-stored in the workflow data **232**. The responses from the coach may be stored as the evaluation information **236**. The evaluation information may include the responses from the coach during an observation of various procedures performed by a technician as part of a workflow for a vehicle. The responses may include reason codes entered by the coach. Further, the evaluation information **236** may include numerical scores based on the responses entered by the coach, along with summaries of a coach’s evaluation. The manner in which the numeric scores and the summaries may be generated is described below.

Thus, the data collection **230** includes information on queries posed to coaches, such as the queries and the possible reason codes in the workflow data **232**, and responses from the coaches, such as the coach’s answer and the selected reason codes in the evaluation information **236**. In addition, the data collection includes the scoring information **237**. The scoring information is used to generate numerical scores from the responses entered by a coach. For example, the scoring information may include a matrix of scores that holds numeric score values, each of which corresponds to a particular reason code or other response entered by a coach for a particular step of a particular procedure.

For example, consider the situation described above, where a coach notes that a technician has failed to properly apply clamps during 3D measurement. In response to the query “Were the clamps applied properly?” the coach may select responses of “No”/“Clamps placed in incorrect location for this model of vehicle.” These responses may be stored as digital information identifying the reason code. For this procedure, this query number, and this response, the matrix of scores may hold a numeric value of “3,” indicating that the technician has obtained a relatively low score for this step in the 3D measurement procedure. The score would be correspondingly higher if the technician had correctly performed the workflow step, and correspondingly lower if the technician had performed in a worse manner. For example, the matrix of scores may hold a value of “10” for reason codes indicating that the coach’s response was “Yes”/“Clamps

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properly positioned.” The matrix of scores may hold a value of “0” for reason codes indicating that the coach’s response was “No”/“Clamps not applied to vehicle.”

Numerically, a score in the matrix of scores may be designated by a variable s . The score may be indexed by the particular query and response to which it corresponds, which may be designated by variables q and r , respectively. Thus, the score generated from the matrix may be indicated by the quantity $s(q,r)$, which may be seen as a reference table or as one implementation of the matrix of scores. If a coach scores a total of N steps for a technician working on a workflow for a vehicle, the resulting average score may be calculated numerically. For example, one implementation may use a formula having the following form.

$$\text{Score} = \frac{1}{N} \sum_{i=1}^N s(q_i, r_i)w_i.$$

Here i is an index for a particular query, and w is a weighting factor for the particular procedure being evaluated. The indexes q_i and r_i indicate the various queries and responses, respectively. In addition to the averaging indicated in the above formula, additional averaging may be performed over several observed procedure s , each of which may have a different value of weighting factor w . The numeric score value and the weighting factor may be adjusted by system administrators. In some implementations, the weighting factor may be adjusted to allow user customization. The adjustability of the workflow weighting factor allows an independent control over the contribution of different procedures as reflected in total scores. Similar adjustability may also be provided for aspects of the matrix of scores.

Other scoring techniques are also envisioned. For example, a scoring system may be used without reason codes. Instead, the scoring may be based on a binary evaluation, such as a series of pass/fail or correct/incorrect responses entered by a coach. In this case a scoring technique may use a calculation with a simplified formula in which a coach’s response is represented by a binary variable r having a value of 0 or 1.

$$\text{Score} = \frac{1}{N} \sum_{i=1}^N s(q_i)r_iw_i.$$

Various combinations of these scoring systems may also be implemented, and may also use additional weighting factors. For example, weighting factors and other scoring tools may be employed to reflect degrees of difficulty based on the model of car under repair, on the newness of a procedure, on the experience level of a technician, on the degree of difficulty of an overall workflow, or on the precision required in a particular aspect of a repair, among others.

The data collection **230** may also include the site information **238** and the reference repository **239**. The site information **238** may hold data regarding individual installation sites. For example, the site information **238** may include the names and positions of technical and non-technical personnel at an installation site, the types of equipment available at the installation site, and information on previous coaching and evaluations performed at the installation site, among others. The computing tool **120** may use data from the site information **238** to assist a coach in locating an installation site to be reviewed, to recall the names of staff members at the instal-

lation site, and to recall notes on previous visits to the installation site. The reference repository **239** may include a variety of reference material of interest to coaches, technicians, and other personnel. The reference repository may be accessible through devices such as the computing tool **120** or other networked computer systems **115** or servers **140**. The reference repository may include internet links for information on collision repair materials and processes, a library of articles for teaching and reference on collision repair of automobiles, diagrams showing procedures and detailed procedures for collision repair of automobiles, and other industry-specific information to support the coaching, technical, and procedural activities of technicians, installation sites, and enterprises.

The software tools **220** shown in FIG. 2 include a workflow operations guiding module **242**, an evaluation and verification module **244**, a comparison module **246**, a data-mining module **248**, a certification module **249**, a legal compliance module **250**, and repair procedure compliance module **251**. These modules may be implemented using various combinations of logic circuitry, including software implementations that may run on the processing units **240** in the computing tool **120** or the server computers **140**.

The workflow operations guiding module **242** may be configured to run on the computing tool **120**. The workflow operations guiding module **242** may provide instructions, prompts, and dialog interfaces to guide a user through a coaching of one or more repair procedures or workflows. For example, the workflow operations guiding module **242** may use information from the workflow data **232** to provide a user interface that follows a coach through various steps in a repair procedure. The workflow operations guiding module **242** may prompt the coach with questions for evaluating each step in a procedure. The sequence of questions may be predetermined and linear, or may include decision-point branching, in which the choice of which questions to pose depends on answers received for previous questions. This branching may be based on decision point data stored in the workflow data **232**. The workflow operations guiding module **242** may allow a coach to skip steps. For example, if circumstances require a technician to omit or temporarily delay a particular procedure step, or if that procedure step is not yet completed, the coach may skip the query for that step and proceed to observe the next step or procedure performed by the technician—or by another technician. The workflow operations guiding module **242** may also allow a coach to review and edit the responses entered for each query. The workflow operations guiding module **242** may then store the response information received during observation of a procedure in memory on the computing tool **120** (and/or in the database **130**), as new data for the evaluation information **236**.

The evaluation module **244** uses data gathered through the workflow operations guiding module **242** and other data in the evaluation information **236** to create a review of the evaluation information **236**. The evaluation module **244** evaluates and verifies evaluation information **236** from assimilated sources such as vehicle manufacturers, vehicle testing organizations, industry-recognized training organizations, etc. The review may be in the form of numeric scores for technicians, installation sites, and enterprises. The evaluation module **244** may use the scoring information **237** to generate the numeric scores from the received evaluation information **236**. The numeric scores may be combined with textual information supplied by a coach through the evaluation module to generate reports for the evaluation and coaching of technicians and other personnel, installation sites, and enterprises. Outputs generated by the evaluation module may be stored in

the evaluation information **236**. Technicians, managers, and others may be provided access to the outputs through printed hard copies or through electronic access via computers such as the computer system **115** or the server computers **140**.

The software tools **220** may include components for verifying one or more procedures that a technician has performed on an automobile. That is, as an automobile proceeds through a workflow, the software tools **220** may guide a coach through appropriate analyses so that the coach can perform an objective third-party certification that verifies the observed procedures have been properly executed according to predetermined criteria. The computing tool **120** may be configured with software that allows a coach, as an external observer, to verify the quality, propriety, or completeness of procedures and workflows performed at an installation site. Such a verification of manufacturer-required or industry accepted best practices by a neutral observer can be a valuable assessment of automotive repair procedures. In the example of FIG. 2, the verification is implemented in the evaluation module **244**, so that this module is a combined evaluation and verification module. In this example, verification data are gathered while the responses from a coach are analyzed by the evaluation module **244**. In other implementations, the verification procedures may be implemented by other modules or combinations of modules. For example, verification may be implemented by the workflow operations guiding module **242**, so that a computing tool **120** collects verification data immediately as a coach enters responses to queries on the computing tool **120**. In other embodiments, the workflow operations guiding module **242** and the evaluation module **244** cooperate to verify operations and procedures performed by a technician.

The comparison module **246** reviews the evaluation information **236** and generates comparison summaries for technicians, managers and other shop personnel. The comparison summaries may be generated in hard copy or electronically. For example, the comparison module may generate a summary report comparing a particular technician's scoring information with an overall or average scoring for technicians in the same installation site. Such comparisons may be helpful for evaluation or professional coaching of a technician. The comparison summary may be stored among the summary information in the evaluation information **236**. The installation site or shop personnel may obtain access to the comparison summary through the computer system **115**. Other comparisons that may be generated include: comparisons of a technician with other technicians in the same pay grade, comparisons of a technician with other technicians in the same city or other geographical region, comparisons of a technician with other technicians in the same enterprise, comparisons of a technician with all technicians for whom data are available, or others. Combinations of these comparisons are also possible. For example, the comparison module may be configured to generate a comparison of a technician with all other technicians in the same enterprise, and in the same city, and with the same certifications.

In addition to preparing comparisons of technicians, the comparison module **246** may also generate comparisons of installation sites, groups of installation sites, and enterprises. For example, the comparison module **246** may be configured to compare one enterprise against another. Many other comparisons are also possible, such as comparing an installation site with other installation sites in the same enterprise but in a different region of the country, with similar or different demographics, etc.

The comparison module **246** may also allow specialization or customization of comparison groups. For example the

comparison module **246** may allow a peer group to be defined as a group of installation sites within a particular revenue bracket and having a service relationship with a particular insurance company. Such customization may be implemented by and accessed through a central server or the database **130**. Alternatively, or in addition, such customized peer groups may be defined by individual users, such as the managers of installation sites. Other examples of criteria by which peer groups may be defined include technical criteria (type of equipment available at an installation site or throughout an enterprise, models of vehicles served by technicians at an installation site, certifications attained by technicians, certifications attained by installation sites, number of service bays present in an installation site, or others), business criteria (revenue levels, number of employees, status as a woman-owned or woman-operated or minority-owned company, affiliation with other enterprises or insurance companies, or others), geographical criteria (customized combinations and definitions of city/state/county/region, for example), other criteria, and combinations thereof.

As part of the vehicle repair process, site personnel and coaches typically compare the repair process to repair rules and guidelines to validate that the repair process complies with local, state or federal legal requirements, as well as vehicle-specific repair procedures identified by a vehicle's manufacturer, vehicle testing organizations or industry training organizations. The repair rules and guidelines are generally validated at three points in time surrounding the repair process. The repair rules and guidelines are first validated before the repair process begins. The repair rules and guidelines are then validated during the repair process, and again after the repair process is complete.

Generally, shop personnel validate the repair rules and guidelines before the repair process begins and a coach validates the repair rules and guidelines both during the repair process and after the repair process is completed. A coach validates the repair rules and guidelines by measuring and assessing work performed by the shop personnel. The legal compliance module **250** and the repair procedure compliance module **251** enable the coach and shop personnel to share common repair rules and guidelines to ensure a cohesive adherence to repair rules and guidelines throughout the entire repair process. The legal compliance module **250** and repair procedure compliance module **251** are unique in that both shop personnel and the coach may use similar modules **250**, **251**, where only the coach will typically use the workflow operations guiding module **242**, evaluation and verification module **244**, comparison module **246**, data-mining module **248**, and certification module **249**.

Shop personnel may use the legal compliance module **250** and the repair procedure compliance module **251** as they develop a repair blueprint for a vehicle. A coach may then use the repair blueprint, and a legal compliance module **250** and repair procedure compliance module **251** similar to those used by the site personnel to develop the repair blueprint, to assist the coach in evaluating site personnel who developed the repair blueprint and site personnel who are responsible for repairing a vehicle according to the repair blueprint.

In some implementations, shop personnel develop the repair blueprint for the vehicle through interactions with the computing tool **120**, the legal compliance module **250**, and the repair procedure compliance module **251**, where the computing tool **120**, legal compliance module, and/or the repair procedure compliance module **251** automatically determine a suggested repair blueprint (the vehicle repair procedure) based at least in part on an intelligent decision whether to repair a damaged component of a vehicle versus whether to

replace the damaged component of the vehicle. It will be appreciated that when a damaged component of a vehicle is replaced, the damaged component is replaced by a component that was not previously part of the vehicle. When a damaged component of a vehicle is repaired and not replaced, the damaged component is not replaced by a component that was not previously part of the vehicle.

A suggestion of whether to repair a damaged component of a vehicle versus whether to replace the damaged component of the vehicle may be based on factors such as a cost of a new component; a cost of additional components that may need to be replaced when replacing the damaged component; labor costs associated with repairing the damaged component vs. labor costs for replacing the damaged component; the cost of painting components surround a replaced component (also known as blending); and/or the amount of time a vehicle must be present in an installation site to repair the damaged component of the vehicle vs. the amount of time the vehicle must be present in the installation site to replace the damaged component of the vehicle. In some implementations, these factors may be established based on previous coaching reports regarding coaches observing technicians performing similar repairs. It will be appreciated that by automatically providing a repair blueprint that suggests whether to replace a component of a vehicle versus whether to repair a component of the vehicle based on actual repair procedures that coaches have previously observed, the computing tool **120**, the legal compliance module **250**, and/or the repair procedure compliance module **251** are able to provide more accurate estimates for repair procedures.

Generally, the legal compliance module **250** and the repair procedure compliance module **251** serve as an automated, "upfront" validation that the high-level requirements for a quality repair will be met through an accurate repair blueprint, in contrast to the workflow operations guiding module and the evaluation and verification module which identify how well the actual repair has been made through a step-by-step evaluation and analysis process of the repair procedures that the repair technician(s) used.

Repair technicians use the repair blueprint as their work order or roadmap to determine what repairs are required on the vehicle. Therefore, the repair blueprint is typically specific to the year, make and model of vehicle and developed by an estimator before repairs commence on the vehicle. The developed repair blueprint should comply with any local, state or federal legal requirements, and any vehicle-specific repair procedures identified by a vehicle's manufacturer, vehicle testing organizations or industry training organizations. If the repair blueprint does not comply with legal or repair procedure requirements, the resultant vehicle repair will likely not satisfy legal or repair procedure requirements.

Typically, the legal compliance module **250** will review a repair blueprint by analyzing information in predetermined data fields of the repair blueprint to determine whether the individual items in the blueprint comply with local, state or federal rules, as applicable. This analysis may be done in realtime, interactive mode on each individual item as the repair blueprint is being developed, or after the repair blueprint has been developed through a batch process which will analyze the entire blueprint at once. The legal compliance module will select the appropriate legal compliance rules from the database and apply them against the repair blueprint to determine whether the repair blueprint passes a compliance test. In some cases, the rules will be "hard" rules which must be complied with, whereas other rules may serve as suggestions to improve the repair blueprint.

In one example, in the state of California, the Bureau of Automotive repair requires that a quarter panel replacement operation be described as a “section” on the repair blueprint if only a portion of the quarter panel will be installed on the vehicle. In this example, the legal compliance module will analyze the repair blueprint, select the appropriate legal compliance rules from the database (in this example, for California), compare the rules against the operations included on the repair blueprint (in this example, “replace quarter panel”) and pose the appropriate question to the user (in this example, “Will the entire quarter panel be installed or just a partial replacement?”). If the answer is “partial,” the system will prompt the user to change the operation in the repair blueprint from “replace” to “section.” In another example, if additional damage is found on the vehicle after the original repair blueprint has been developed, certain states may require written authorization from the vehicle owner prior to commencing any additional repairs on the vehicle. In this example, the legal compliance module **250** would determine that a supplemental repair blueprint is being developed, select the appropriate legal compliance rules from the database, and prompt the user to document the method of authorization obtained, such as whether authorization was done in person or through e-mail, etc., name of the person who authorized the repairs, the date and time of the authorization, etc.

Typically, the repair procedure compliance module **251** will review a repair blueprint by analyzing information in predetermined data fields of the repair blueprint to determine whether individual items in the repair blueprint comply with any vehicle-specific repair procedures identified by the vehicle’s manufacturer, vehicle testing organizations or industry training organizations. The repair procedure compliance module **251** may determine whether individual items in the repair blueprint comply with vehicle-specific procedures in a real-time, interactive mode as the repair blueprint is being developed, or after the repair blueprint has been developed through a batch process which will analyze the entire repair blueprint at once. The repair procedure compliance module **251** will select the appropriate repair procedure compliance rules from the database and apply them against the repair blueprint to determine whether the repair blueprint passes a compliance test. Repair procedure compliance rules may follow a hierarchy approach, based on the specific vehicle, operation and part identified in the repair blueprint. At the most detailed level, repair procedure compliance rules will apply to a specific repair operation (such as “replace”, “section”, “remove and install”, “remove and replace”, etc.) and a specific vehicle part (such as a “door skin”, “frame rail”, “upper unibody frame”, etc.) and a specific vehicle (such as “2002 Honda Pilot with VIN number 12345”). The following illustrates how the hierarchy convention may apply:

Retrieve and apply any repair procedure rules for the vehicle Year, Make, Model and VIN.

If no repair procedure rules are available for the vehicle Year, Make, Model and VIN, retrieve and apply any repair procedure rules for the vehicle Year, Make and Model.

If no repair procedure rules are available for the vehicle Year, Make and Model, retrieve and apply any repair procedure rules for the vehicle Make and Model.

If no repair procedure rules are available for the vehicle Make and Model, retrieve and apply any repair procedure rules for the vehicle Make.

If no repair procedure rules are available for the vehicle Make, retrieve and apply any general repair procedure rules for the repair operation.

As an example, the repair procedure compliance module **251** may contain three rules: one rule regarding a Toyota

Tundra which indicates that the lower perimeter frame rail can not be sectioned, a second rule which applies to any Toyota frame rail which indicates the upper unibody frame rail can not be sectioned, and a third rule which applies to any frame rail on any vehicle. In this example, if the repair blueprint is developed for a 2004 Toyota Tundra and identifies that the upper unibody frame rail is being sectioned, the repair procedure compliance module **251** will analyze the repair blueprint, select the appropriate repair compliance rules from the database (in this example, rule number two for any Toyota frame rail since the upper unibody frame is being repaired, not the lower perimeter frame), and indicate to the user that the selected operation is invalid for the vehicle being repaired.

Once site personnel develop the repair blueprint and the repair process begins on the vehicle, the coach may review the repair blueprint to confirm the vehicle is being repaired, or has been repaired, in compliance with the repair blueprint. In one embodiment, a copy of the repair blueprint is transferred electronically to the computing tool of the coach using industry-standard communication methods defined by the Collision Industry Electronic Commerce Association (CIECA), ACORD, ANSI, or other mechanical repair standards organizations, or through the use of a proprietary interface method. In other embodiments, a paper copy of the blueprint may be made available to the coach to facilitate the review process.

Once the coach receives the repair blueprint, the coach may access a legal compliance module **250** or a repair procedure compliance module **251** on the computing tool similar to those used by the site personnel to develop the repair blueprint. However, the legal compliance module **250** and repair procedure compliance module **251** accessed by the coach may not be the same legal compliance module **250** and repair procedure compliance module **251** used by the site personnel to develop the repair blueprint. The legal compliance module **250** and repair procedure compliance modules **251** accessed by the coach provide reference information that the coach can use in evaluating the site personnel. Typically, the modules **250**, **251** provide the coach with a series of questions on the computing tool used to evaluate whether the repair blueprint complies with local, state or federal legal requirements, or vehicle-specific repair procedures identified by a vehicle’s manufacturer, vehicle testing organizations or industry training organizations. In one embodiment, the most recent compliance rules may be downloaded when the coach connects the computing tool to a server to download new evaluation assignments.

In addition to evaluating shop personnel, a coach may also use the repair procedure compliance module **251** as a tool to mediate disputes between shop personnel, customers, and insurance company personnel. During development of a repair blueprint, it is not uncommon for disputes to arise between shop personnel, customers and insurance company personnel regarding the best method for repairing a damaged vehicle. To mediate a dispute, shop personnel may request a coach serve as an independent third-party mediator. Along with the mediation request, shop personnel may send supporting documentation to the coach such as the repair blueprint, digital images, and frame and alignment specifications. The coach may then view the mediation request and supporting documentation on the computing tool or through another interface method. Additionally, the coach may access the repair procedure compliance module **251** to assist the coach in offering a recommendation to the disputing parties. Typically, the mediation request is routed to the coach that is most qualified to address the specific issue in dispute.

FIG. 3 is a block diagram of one implementation of a procedure 300 for coaching, review, verification and certification. In act 310, a coach is assigned to provide coaching at a client's facility, which may be a collision repair shop or other installation site. The assignment may be downloaded onto a computing tool. Appropriate software and data may be pre-loaded onto the computing tool. If needed information or software is not available on the computing tool, the coach may download the appropriate material onto the computing tool prior to visiting the installation site. If the coach is physically visiting the installation site, the computing tool may assist the coach with directions to reach the installation site. If the coach is virtually visiting the installation site, the computing tool may assist the coach in setting up a communication channel, such as a video teleconference, with the installation site. The computing tool may additionally provide advance reminders regarding protocol and amenities at the installation site, or any other type of available information that may be useful to a coach visiting an installation site. For example, the computing tool may provide a reminder such as, "Today is technician Ms. Smith's birthday," or "Make initial greeting with shop manager Davis," or "Join the staff for their Friday donuts prior to 7 AM shop opening."

In act 315, the coach initiates a visit with the installation site. When a coach physically visits an installation site, act 315 may occur when the coach arrives at the installation site to be evaluated and checks in with local personnel, aided with reminders by the computing tool. When a coach virtually visits an installation site, act 315 may occur with the coach establishing communications with the installation site, such as establishing a video teleconference, and checking in with the installation site personnel, aided with reminders by the computing tool. The coach may obtain updated personnel information and other site-specific information at this time and enter such updates into the computing tool so that a central database may be apprised of any changes. Additional initial procedures may be performed, such as an evaluation of shop cleanliness and safety compliances.

In act 320, the coach selects a vehicle and a technician performing repairs on the vehicle. The coach may then observe repair activities performed on the vehicle by the technician and record observations on the computing tool. The vehicle may be identified by a vehicle identification number (VIN) or other information that may identify the vehicle in act 322. The technician may be identified by name or by an employee number in act 324. Act 320 may include additional preparatory steps. For example, once the coach has identified the procedures to be observed, the computing tool may have an option to automatically print some relevant reference diagrams for the procedures. The printing may be done either with a built-in printer or by transmitting to a local printer or print server via a local IR or RF wireless link.

The coach observes the repairs in act 330. The coach may first consult with the technician to understand what repair procedures are to be performed on the vehicle. The coach then selects an appropriate procedure data set on the computing tool to match the procedures that will be or have been performed by the technician. The computing tool then provides the coach with a series of queries 332 that allow the coach to enter responses 334 regarding the performance of the technician. After each query and response, the computing tool proceeds to the next appropriate query and response to match the next step that should be performed by the technician. In some cases, the computing tool will come to a branching point, at which there may be several possible subsequent steps. At these branching points 336, the computing tool may query the coach to ask which step is being performed next by the technician, or what procedures will be observed next. Alternatively, when appropriate, the computing tool may select a subsequent query based on the coach's response to a previous query.

nician, or what procedures will be observed next. Alternatively, when appropriate, the computing tool may select a subsequent query based on the coach's response to a previous query.

In addition to entering textual or selection information, a coach may enter photographic information 338 into the computing tool. For example, when a coach physically visits the installation site, the coach may use an attached camera (or a camera integrated into the computing tool) to record photographic information such as digital images. Alternatively, when a coach virtually visits the installation site, the coach may record digital images of a repair procedure such as video from a video teleconference or digital images, such as photographs or videos, emailed to the coach from a technician. Digital images, such as video or photographs, may be stored on the computing tool or in a remote database. Such digital images may be useful to record images of work performed on interior portions of an automobile, before those portions are hidden by outer layers of material during subsequent procedures. Such digital images may also be useful to document the verification of procedures in a workflow. Digital images may also be helpful coaching tools, to illustrate examples of incorrectly performed procedures. Similarly, digital images may be valuable tools for the coaching of technicians with overall good practices, but who could benefit from fine adjustments in technique. Digital images may also be used to record examples of high quality work, for use as examples in providing positive feedback and in coaching other personnel.

After the coach has completed or terminated observation of the procedure, the computing tool then reports the results of the coach's observations in act 340. The computing tool may make a transmission of the observations (or a summary of the observations) to a central database in act 341. This transmission may include an automatic transmission of the digital images discussed above with respect to act 338, emails, or other communications with appropriate supplemental information that is tailored to the observations made by the coach. For example, if the coach's observations indicate that a technician experienced some difficulty or confusion in the application of seam sealer, the transmission in act 341 may automatically include some links or PDF files or flowchart diagrams or standards requirements that would be instructive to the technician or the technician's manager for further reference and review. For example, the transmission may include relevant step-by-step flowcharts, torque tolerances and limits, a review of optional procedures that may be of interest to a customer, a list of recommended testing techniques to verify the quality of repairs, or other information. Such information may be obtained from a local or a remote repository, such as the reference repository 239.

The coach may review notes on the computing tool to provide a coaching feedback to the technician at the installation site in act 343. Feedback may also be provided to the management personnel at the installation site. The immediate feedback may also include reference material that is manually or automatically selected to be appropriate for the review. Such material may be obtained through the computing tool from the reference repository 239, for example. Additionally, the coach may report on the observations to the management of an installation site in act 342. A report to management may include a combination of observations on several technicians, as well as on support staff, management, and procedures at the installation site.

The coach's reporting may also provide the service of verifying the procedures, workflows, and overall operations observed by the coach at the installation site and certifying a repair based on the verification of the repair steps performed

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during the repair procedures. Thus, the reporting in act **342** may include both a review and verification of an installation site or the personnel at the installation site, and a review and verification of the performed repair. Here, the coach may provide an installation site with the benefit of a third-party review that verifies and certifies activities at the site. Such verifications and certifications may assist an installation site (and the installation site's sponsoring customers and insurance companies) by providing external evaluations on the workflows performed on specific vehicles, on the competence of technicians, and on the installation site's overall procedures, quality and performance.

The reporting may further include an escalation **345** if the coach determines that the participation of others is needed to provide further coaching, refresher information, feedback, or other actions. The data collected may also be provided in monthly reports, trend graphs, and comparison summaries in act **347**. After-visit reporting and coaching may also include interactive communication, such as a scheduled post-visit, "tele-coaching" via telephone or email or coaching in response to follow-up questions from personnel at an installation site. During "tele-coaching," a coach may answer additional questions or resolve issues based on the coach's offsite review of digital images of a vehicle's damage.

The computing tool may provide interfaces for other information collection as well. For example, the computing tool may include interfaces to record changes in the staff at an installation site. More specific information may also be recorded, such as an unexpected absence of a technician, or the departure of an experienced manager. Such information may be useful in interpreting monthly reports and performance trends. For example, if a senior technician retires from an installation site, that fact may be helpful in understanding a subsequent dip in a monthly performance review for the installation site.

The coach may also be assisted by the computing tool to provide information for generalized ongoing professional improvement **350** to personnel at an installation site. Alternatively, or in addition, the coach may provide individualized professional training to improve the skills of a particular technician, site personnel, installation site, or enterprise. These activities **350** may involve a dissemination of literature, flow diagrams, charts, or other relevant information. For example, the computing tool may include reference information that the coach may consult as needed while answering specific questions during discussions with personnel at an installation site. The computing tool may further include a lecture presentation with a "Topic of the Month" to be provided to an audience of technicians or site personnel at the conclusion of a visit to an installation site. The computing tool may be used to disseminate information for the advancement of professional expertise throughout the course of a site visit, following any initial procedures such as, for example, act **317**.

Additional coaching tools may also be provided through the computing tool. For example, the computing tool may include tools for identifying knowledge gaps for particular technicians; site personnel such as managers, estimators, and administrative personnel; installation sites; or enterprises as a whole. This identification may be based on data mining of scores and evaluation information received through coaching procedures. Knowledge gaps may be used to generate specific immediate specialized instruction or to prepare an ongoing program for further development. For example, a series of "Topics of the Month" may be selected, or one-on-one per-

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sonalized coaching provided, or a customized hands-on coaching clinic delivered, based on identified knowledge gaps.

The reporting information assembled in act **340** may be used for more than immediate coaching and periodic review. For example, the data collected by a coach and the subsequent analyses may be used to provide information in support of a certification program **360**. Certifications may be made for individual technicians, for installation sites, and for enterprises, for example. The data may also be used for data mining, as illustrated in act **370**. For example, the data may be searched, either on the coach's computing tool or by a central computer, for correlations, patterns, or subtle connections related to issues arising for particular vehicle models, parts, technicians, installation sites, enterprises, and geographical factors, among other issues, and combinations thereof. Technicians may additionally search the data for assistance before performing a vehicle repair procedure. For example, before performing a repair, a technician may search for a video, instruction, notes, Topic of the Month, reference material, or pictures that were previously used to coach other technicians performing a similar repair so that the technician may learn how to perform the repair before performing the actual vehicle repair procedure.

The data may also be mined for customer development, to better provide services for the customers of an installation site or enterprise. Data mining may also include customer satisfaction indexing (CSI), which searches for correlations between customer satisfaction and quality of repairs. For example, the mining may seek to determine which positive and negative scores among the various procedures of collision repair have the most significant impact on customer satisfaction as indicated by customer surveys, repeat business, complaints, and compliments. Data mining may also involve a review of data for consistency in the "paperwork" side of an installation site's activities. For example, a software tool may be used to double-check a paper trail (or a data trail) for mistakes in completed workflows (such as a missed intermediate inspection as part of a larger workflow), so that corrections may be made before a workflow is erroneously closed. On another scale, data review may perform ongoing consistency checks to catch unlikely but crucial errors (such as an inadvertent billing for a procedure that was not performed). A further example of data mining may include the mining of management indicators, to ascertain what qualities of management personnel (certifications, personality scores, education, geographical background) have positive or negative correlations with overall customer satisfaction, or with customer satisfaction in various geographical regions.

FIG. **4** is an example of a screenshot for a computing tool interface **400** for a coach to review an assignment to visit an installation site. The screen allows a coach to obtain from computing tool information such as the name and location **410** of an installation site, a scheduled visit date **420**, information on personnel at the installation site **450**, and past notes available on the installation site **460**. The interface allows the coach to change the scheduled visit date **430**, decline the assignment **440**, or proceed to subsequent interfaces for the coaching assignment **470**.

FIG. **5** is an example of a screenshot for a computing tool interface **500** for reviewing notes on an installation site. The screenshot includes notes on general information **510** about an installation site to be visited, and notes from prior coaching visits **520**. The prior notes may have been entered by the same coach about to perform a visit, or by a different coach, or by other personnel.

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FIG. 6 is an example of a screenshot for a computing tool interface **600** for updating a database with information on a new technician at an installation site. The interface allows a coach to enter identifying information **610** for a new technician, along with information on departments or groups in which the new technician may work **620**. The coach may navigate to other screens in the computing tool interface **630**.

FIG. 7 is an example of a screenshot for a computing tool interface **700** for observing a repair procedure. The interface **700** may include identifying information **710** for an installation site being visited. In this example, the interface prompts a coach for review information on a particular step being performed in a vehicle repair/evaluation procedure: “3D measuring” **720**. The interface allows the coach to identify the technician performing the step **740**. The interface queries a coach on one out of a series of steps—in this case, “Were the clamps applied properly?” **725**, and allows the coach to enter a yes/no response **730**. The interface also provides the coach with some performance history **750** for the technician on this particular step: “This tech has committed this offense 1 time (s) before.”

The interface for this particular step includes further queries **770**. For example, a coach may select among one of several reason codes **760** to explain why the technician or site personnel being observed did or did not succeed in this step. The reason codes are a predetermined set of common explanations particular to this step. The coach may also identify further corrective action **780**, such as escalating the issue to the attention of the technician’s manager, or marking a reminder to pursue individualized coaching for this technician. The interface **700** allows the coach to navigate **790** to other computing tool screens.

FIG. 8 is an example of a screenshot for an interface **800** for interacting with a remote database from an installation site. This interface may be presented on a personal computer so that personnel at an installation site may enter information into a remote database. In this example, a personnel manager may update a remote database having with information on a new technician. The interface **800** may display information on the installation site **805**, and prior information on the technician **810**. A user may enter or update information such as name **820**, departments **830**, experience level **835** (e.g., journeyman or apprentice), address **840**, phone information **842**, specialties **832**, experience **834**, and prior certifications **836**.

FIG. 9 is an example of a screenshot for an interface **900** for retrieving information from a remote database at an installation site. In this example, a personnel manager may review information about a technician in a remote database. The interface **900** may allow a user to navigate to other interfaces to update **910** the information or proceed to another interface **920**, or to terminate a session.

While various embodiments of the invention have been described, it will be apparent to those of ordinary skill in the art that other embodiments and implementations are possible that are within the scope of the invention. Accordingly, the invention is not to be restricted except in light of the attached claims and their equivalents.

The invention claimed is:

1. A system for collection of evaluation data, comprising:
 - a computing tool configured to communicate with a database, the computing tool configured to receive digital images showing a technician at an installation site performing a vehicle repair procedure;
 - a workflow operations guiding module operable on the computing tool and configured to provide instructions and one or more dialog interfaces to query a user for

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evaluation information on steps performed by the technician in the vehicle repair procedure as specified in the database and prompt the user for responses including observations regarding the technician, reason codes, corrective actions, or scoring information; and

an evaluation module configured to receive the evaluation information and the digital images, to evaluate and verify the evaluation information from assimilated sources, and to generate a review summary of the technician based on the evaluation information and the digital images showing the technician at the installation site performing the vehicle repair procedure.

2. The system of claim 1, wherein the digital images comprise a photograph.

3. The system of claim 1, wherein the computing tool is configured to receive an e-mail including the digital images of the vehicle repair procedure.

4. The system of claim 1, wherein the digital images comprise video of the vehicle repair procedure at the installation site.

5. The system of claim 4, wherein the computing tool is configured to receive an e-mail including the video of the vehicle repair procedure.

6. The system of claim 4, wherein the video of the vehicle repair procedure is received in real time.

7. The system of claim 4, wherein the video of the vehicle repair procedure is part of a video teleconference between a coach and the technician at the installation site.

8. The system of claim 1, wherein the database in communication with the computing tool is operative to store the digital images of the vehicle repair procedure received by the computing tool and wherein the database is operative to be searched by a second technician to retrieve the digital images of the vehicle repair procedure.

9. The system of claim 1, wherein the computing tool is a mobile computing tool.

10. The system of claim 1, wherein the computing tool is further configured to determine a suggested vehicle repair procedure and to suggest the suggested vehicle repair procedure to the technician.

11. The system of claim 10, wherein to determine the suggested vehicle repair procedure, the computing tool is further configured to determine whether to suggest replacing a damaged component of a vehicle or whether to repair the damaged component of the vehicle based on a cost of any components that will need to be replaced when replacing the damaged component, labor costs associated with replacing any components that will need to be replaced when replacing the damaged component, labor costs associated with repairing the damaged component of the vehicle, a cost of painting any components that will need to be replaced when replacing the damaged component, a cost of painting any additional components surrounding the components that will need to be replaced when replacing the damaged component, an amount of time the vehicle must be present in an installation site to repair the damaged component of the vehicle, and an amount of time the vehicle must be present in the installation site to replace the damaged component of the vehicle.

12. A method for providing coaching for repair technicians, the method comprising:

- receiving, at a computing tool, digital images of a technician performing a vehicle repair procedure at an installation site;
- generating a query from a database on a repair step of the vehicle repair procedure that is performed by the technician;

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displaying instructions and dialog interfaces to provide the generated query on an interface of the computing tool and prompt a user for responses including observations regarding the technician, reason codes, corrective actions, or scoring information; 5

receiving an input regarding the repair step of the vehicle repair procedure that is performed by the technician in response to the query whose value is based on the digital images of the technician performing the vehicle repair procedure; and 10

generating at least one of coaching, evaluation, verification or certification information for the technician based on the response to the query, evaluation information from assimilated sources, and the digital images of the technician performing the vehicle repair procedure. 15

13. The method of claim **12**, wherein the digital images comprise video of the repair procedure.

14. The method of claim **13**, wherein the video of the repair procedure is received in real time.

15. The method of claim **12**, wherein the digital images comprise a photograph.

16. The method of claim **12**, further comprising:

storing the received digital images of the vehicle repair procedure in a database in communication with the computing tool; 25

receiving a search query associated with the vehicle repair procedure from a second technician; and

sending the digital images of the vehicle repair procedure to the second technician. 30

17. A non-transitory computer-readable storage medium comprising a set of instructions for providing coaching for repair procedures, the set of instructions to direct a processor to perform acts of:

receiving, at a computing tool, digital images of a technician performing a vehicle repair procedure at an installation site; 35

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generating a query from a database on a repair step of the vehicle repair procedure that is performed by the technician;

displaying instructions and dialog interfaces to provide the generated query on an interface of the computing tool and prompt a user for responses including observations of the technician, reason codes, corrective actions, or scoring information;

receiving an input regarding the repair step of the vehicle repair procedure that is performed by the technician in response to the query whose value is based on the digital images of the technician performing the vehicle repair procedure; and

generating at least one of coaching, evaluation, verification or certification information for the technician based on the response to the query, evaluation information from assimilated sources, and the digital images of the technician performing the vehicle repair procedure.

18. The computer-readable storage medium of claim **17**, wherein the digital images comprise video of the repair procedure.

19. The computer-readable storage medium of claim **18**, wherein the video of the repair procedure is received in real time.

20. The computer-readable storage medium of claim **17**, wherein the digital images comprise a photograph.

21. The computer-readable storage medium of claim **17**, further comprising a set of instructions to direct a processor to perform acts of:

storing the received digital images of the vehicle repair procedure in a database in communication with the computing tool;

receiving a search query associated with the vehicle repair procedure from a second technician; and

sending the digital images of the vehicle repair procedure to the second technician.

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